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THE DIAGNOSTIC VALUE OF THE WINTRICH TRACHEAL SOUND.

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MODERATE percussion over any portion of the normal thorax gives a sound of a certain character which is not modified by the patient holding the mouth open. If at the same time the examiner percusses the thorax he place his ear near the patient's nose he will perceive no difference in the character of the sound. Under normal conditions moderate percussion-vibrations are not communicated to the large bronchi, consequently the column of air in the trachea is not implicated in the percussion, and no sound issues from the nose.

Under certain pathological conditions the vibrations of a moderate percussion stroke will be communicated to the large bronchi, thus involving the column of air in the trachea. Under such conditions there will be two sounds conducted to the examiner's ear—one directly from the thorax through the atmosphere, the other through the trachea and nares or open mouth. Wintrich described the modification of the percussion note over cavities in the lung that occurred when the patient held the mouth alternately open and closed. When the mouth was opened the percussion-note became more tympanitic and clearer and higher in pitch, because the open mouth permits the pharynx to act as a resonator over the column of air in the trachea, which is set in vibration when the percussed cavity communicates with a bronchus. Williams noticed the same modification of the percussion-note over consolidated areas of the lung at the apices and also over the upper thorax when the lung was compressed from pleurisy with effusion. In both consolidation and compression of the upper lobes of the lungs the consistency of the lung is increased, so that the vibrations from moderate percussion are communicated to the large bronchi and trachea. The implication of the column of air in the trachea can be recognized when the patient's mouth is closed if the examiner will compare the sound as transmitted directly through the air to his ear with that heard when the ear is close to the patient's nostrils. In cases of moderate infiltration of the apices of the lung, when the characteristic Wintrich tracheal sound cannot be demonstrated by having the patient hold the mouth alternately open and closed, one may recognize a distinct difference in the sound heard at a distance and heard at the patient's nostrils. The sound heard at a distance is dull, high in pitch, and short in duration; the sound at the nostrils is tympanitic, high-pitched, and longer in duration. One can easily recognize the sound as issuing from the nares with moderate percussion.

This modification of sound is not demonstrable by light percussion over the bases of the lungs when consolidated, because of the remote position of the larger bronchi. In cases of infiltration at the base of the lung, when the thorax is percussed by striking a firm blow with the palmar surface of the ends of the metacarpal bones, the tracheal change of sound can be demonstrated, provided the bronchi are not stopped. This sign may in some instances be of service in differentiating between pulmonary consolidation and pleurisy with effusion. I have been able to demonstrate this phenomenon in several cases of miliary tuberculosis and lobar pneumonia, but never in pleurisy with effusion or hydrothorax.

When the percussion vibrations are readily communicated to the tracheal column of air, in either consolidation or cavity formation, this relation can be appreciated by the percussing finger as well as by the ear. The following experiment will illustrate this statement: Let the examiner percuss the supraclavicular space, holding his eyes closed during the experiment. The patient is instructed to hold the mouth closed, and an assistant will close the patient's nostrils from time to time while the examiner is percussing. The examiner can tell when the patient's nostrils are closed, though the sound is not modified as it reaches the ear. He recognizes the closure of the nostrils by a perceptible increase of resistance to the percussing finger. I have been able to do this successfully in cases of pneumonia at the apex as well as in cases of tubercular cavities at the apices. This experiment gives one a good conception of the accessibility of the tracheal column of air when the consistency of the intervening medium is increased.

Thus far we have dealt with the tracheal sound only as it occurs in consolidation, compression, and cavity of the lungs. In a normal adult percussion over the upper portion of the sternum will not give a tracheal sound, because the inflexibility of the sternum and the softness of the tissues intervening between the sternum and the trachea are unfavorable for the transmission of vibrations to the trachea or bronchi. If the medium between the sternum and the trachea be increased in consistency a light percussion stroke over the manubrium will give a tracheal tone as clear as that heard over a cavity at the apex. The following case is a good illustration of this fact.

An old inmate of the infirmary was brought to the City Hospital, complaining of dyspnœa. Physical examination revealed moderate cyanosis and dyspnœa; temperature 101° F. The entire left thorax was dull, increasing to flatness over the lower portions, with great resistance to the percussing finger; respiratory excursion diminished. The palpable fremitus was diminished over the upper portions and absent over the base of the thorax. There was loud bronchial inspiration and expiration, attended with medium moist and dry râles over the upper thorax. Over the lower portions there was distant bronchial inspiration and expiration. The heart was not dislocated to the right. There was no distention of the jugular veins and no œdema of the head or neck. There was no enlargement of the palpable lymph-glands. Over the left thorax a tracheal tone was demonstrable on percussion over the supraclavicular and infraclavicular, the suprascapular and the left interscapular regions. Here were all the signs of a pleurisy with effusion, with attendant compression of the lung, and the findings made such a diagnosis necessary; but during the examination it was noticed that the tracheal sound became much more distinct as we percussed toward the median line. Though the manubrium was not markedly dull or resistant on percussion, the tracheal sound attending percussion of the manubrium was much more distinct than over the apex of the lung. On this sound alone a diagnosis of mediastinal tumor with transudation in the left pleural cavity was made. About four pints of serum were aspirated from the left pleural cavity. This did not affect the percussion-note over the manubrium; the tracheal sound remained as distinct as before the fluid was removed. Percussion in the left interscapular region gave the same tracheal sound.

The autopsy revealed a lymphosarcoma, the size of a large fist, occupying the mediastinum. Since this case was seen I have had frequent opportunities to study the tracheal sound over the apices in bilateral consolidations and in pleurisy with effusion. In no instance was there a tracheal sound produced by percussing over the manubrium, though percussion in the supraclavicular and infraclavicular spaces gave a distinct tracheal sound.

This case was seen in August, 1897. Since that time four more cases of sarcoma of the mediastinum have come under my observation. In all but one a distinct tracheal sound attended percussion over the manubrium. The one which failed to give the tracheal sound was in a child, four years old. There were in this instance several other indications of mediastinal tumor, such as fever, dyspnœa, free fluid in the left pleural cavity, dulness over the manubrium, and enlarged lymphatic glands in the axilla. The relative position of the tumor and trachea as found at autopsy did not explain the absence of the tracheal sound. The only possible explanation to my mind is that the child instinctively closed the glottis whenever the manubrium was percussed, though the precaution was taken to percuss during inspiration.

In two of the remaining three cases there were evidences enough beside the tracheal tone to make the diagnosis. Though the autopsy in both instances revealed large lymphosarcomata filling the mediastinum, the tracheal sound could be demonstrated only during forced inspiration During expiration not the slightest suggestion of it could be elicited. During forced inspiration the Wintrich change was as clearly defined as it would be over a large cavity in the apex of the lung. The explanation for the sound being demonstrable during inspiration only may be found in the descent of the trachea and tension on the structures in the mediastinum during the act of inspiration. In this manner the tumor is possibly brought into more intimate contact with the sternum, thus favoring the production of the tracheal sound. The autopsies, however, showed the trachea to be surrounded by the neoplasms, and the neoplasms were firmly adherent to the sternum. It is very difficult to understand how the inspiratory act should be necessary for the production of the phenomenon when the relative positions of the parts as found at autopsy seem to present all the conditions required for the tracheal sound.

Aneurisms of the first portion of the arch of the aorta will give the tracheal sound as distinctly as do solid tumors. I have had the opportunity to demonstrate this sign in four cases of aneurism of the first portion of the arch. In every instance the sound could be brought out during deep inspiration only. In one case it disappeared after a few weeks' rest in bed. With the disappearance of the tracheal sound there were also modifications of other physical signs, which indicated a diminution in volume of the aneurismal sac. This patient left the hospital much improved, but died suddenly several months afterward, and was autopsied at the coroner's morgue. The examination revealed a thin-walled aneurismal sac of the ascending arch, which was not larger than a hen's egg.

Another very unique case in which the tracheal sound was of great diagnostic service was one of pericarditis with effusion, which presented considerable difficulty for differential diagnosis from pleurisy with effusion and pneumonia with mediastinitis.

By percussing lightly over the sternum at Louis' angle a distinct tracheal sound was demonstrable during forced inspiration only. The tracheal sound could be produced only by percussion over a sharply defined area. This area extended on the sternum three-quarters of an inch above Louis' angle to three-quarters of an inch below the angle. Over the left infrascapular area of dulness, which commonly occurs in pericarditis with effusion, percussion was accompanied by a distinct tracheal tone. It was, however, unaffected by the respiratory phases. The tracheal sound in the two positions referred to were due to different causes. That brought out by percussion over the infrascapular area was due to percussion over a compressed lung, while the tracheal sound produced by percussion of the sternum was caused by the pericardial cul-de-sac (formed by the reflection of the pericardium over the large vessels at the base of the heart) being distended with fluid.

The cul-de-sac occupies the anatomical position over which the tracheal sound was produced. This sac of fluid lay between the sternum and the bifurcation of the trachea. During forced inspiration the bifurcation of the trachea would be pulled downward into more intimate contact with the pericardial sac, and thus favor the transmission of the percussion vibrations through the sac of fluid to the large bronchi. Paracentesis was made in the fifth interspace, half an inch to the right of the sternum. About eight ounces of bloody serum were withdrawn from the pericardial cavity, and directly afterward the Wintrich tracheal sound on percussion over the sternum disappeared.

The question may be raised as to whether the Wintrich or the Williams tracheal tone may not occur with percussion over the manubrium in normal cases. So far I have found only one patient in whom the tracheal sound could be elicited by moderate percussion over the manubrium, and in whom there was doubt as to the existence of a mediastinal mass. This patient complained of dyspnœa and some difficulty in swallowing. No other signs of mediastinal tumor were present. The case was lost sight of, so whether this instance is an exception to the rule or not must remain in doubt.

There are several precautions to observe in testing for the tracheal sound where mediastinal involvement is suspected. The chin should be elevated to produce as much longitudinal tension as possible on the trachea; this seems slightly to favor the sign. Then, too, if a patient is told simply to take a deep inspiration, at the height of the inspiration the glottis is instinctively closed, as in this way the thorax is maintained in the inspiratory phase with the least possible effort; and if the vocal cords are approximated all sounds from the trachea are cut off and the tracheal sound will not be audible.

The patient should be instructed to take a deep breath and continue the inspiratory effort after the thorax has reached the height of its excursion; by so doing the vocal cords are kept apart and the passage of sound and air from the trachea is not obstructed.

One should have the patient hold the mouth open, with the tongue protruded. The examiner should percuss gently over the manubrium, and continue this throughout the act of inspiration. He should place his ear directly before the patient's mouth. When the tracheal sound is present it can be easily recognized by its characteristic metallic resonance and issuance from the mouth. The sign when present is so striking that the most inexperienced investigator could not fail to recognize it.

The tracheal sound is produced by percussion over the upper portion of the sternum whenever there is a solid or liquid mass which will communicate the percussion vibrations to the bronchi. This will occur in mediastinal tumor, aneurism of the ascending arch of the aorta, and pericarditis with effusion, provided there is a sufficient amount of fluid to distend the pericardial cul-de-sac over the origin of the large vessels at the base of the heart.

The tracheal sound from percussion of the manubrium is not present in consolidation or cavity of the upper lobes of the lungs, nor is it present in pleurisy with effusion.

In searching medical literature I can nowhere find any mention of this sign in connection with tumor of the mediastinum. It has been of considerable service to me in differential diagnosis. It should be of assistance to the surgeon in determining upon the advisability of operation on tumors of the neck

SPLENIC PSEUDOLEUKÆMIA (ANÆMIA SPLENICA; SPLENOMEGALIE PRIMITIVE),

WITH THE REPORT OF A CASE.[1]

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The object of this article, briefly stated, is (1) to further the recognition of a very rare and fatal disease, to which the term splenic pseudoleukæmia seems most applicable; (2) to contribute to its symptomatology and pathology; (3) to record the results of experimental research, employed with a view of determining its nature and etiology; (4) to present reasons why, in the light of our present knowledge and experience, the removal of the spleen is the treatment to be advised when the diagnosis is certain and the conditions not especially unfavorable.

Report of Case. Anton B., Russian, aged forty-five years, was referred to my clinic at the Post-graduate Medical School of Chicago by Drs. Alexander H. Ferguson and G. Burdick, on April 16, 1898.

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[1] A critical summary of the literature on this disease, by the same author, will be published in a subsequent number of the Journal.

The following history was obtained: *Family History.* Mother died of old age; father died of unknown cause; no tuberculosis in the family, to his knowledge. *Personal History.* The patient has not had malaria nor has he lived in a malarial district; he has not had syphilis nor gonorrhœa; his wife had five healthy children and no miscarriages; he has not had typhoid fever or any previous illness since grown up, and never used alcoholics. He came to Chicago nine years ago, and has not lived outside the city since. Was always strong and healthy. About three and a half years ago he noticed a swelling in the left hypochondriac region. The mass was firm, but not painful on pressure or otherwise. At about the same time he also noted that he was easily fatigued. Shortly after this he complained of slight nausea, and vomited occasionally. His appetite soon became impaired, and it has not been good since. About three and a half years ago, or at about the time the swelling in the left side was first noticed, the patient had diarrhœa (three to four stools daily), which continued for nearly six months. Since then he has been rather constipated. Has had chilly sensations now and then, followed by fever; no distinct chill was ever experienced. This disturbance in temperature was not accompanied by pain, nausea, or vomiting. The patient has complained of shortness of breath from about the time the swelling was noticed, and this has gradually increased; now and then dizziness and headache have been present. Palpitation of the heart has not been noted; pain on breathing has never been present. Epistaxis began about two years ago, and since then has often been repeated; it has varied in amount from a few drops to a tablespoonful; previously the patient seldom had nose-bleed. The feet and ankles began to swell about one month ago, and since then have not been free from swelling. He has noticed a gradual growth of the tumor in the left side. The greatest local discomfort he describes as a feeling of fulness and pressure in the epigastric and left hypochondriac regions. He has never experienced pain in any portion of the abdomen. He has lost about twenty-five pounds in weight, and is not able to walk more than a very short distance without experiencing fatigue and dyspnœa.

Physical Examination. Patient rather poorly nourished; slight subicteric hue of skin and conjunctivæ. The mucous membranes show evidence of anæmia. The skin and finger-tips present the peculiar pallor of a moderately profound anæmia. Ears and nasal cavities negative; mouth and pharynx negative; tonsils normal size; glands at base of tongue not enlarged; laryngoscopic examination negative. The bloodvessels of the neck pulsate very distinctly. There are no glandular enlargements in the cervical region. A small kernel is palpable in the right axillary region. The inguinal glands of both sides are very slightly enlarged, but not more than is frequent in men. Œdema of the lower extremities in moderate degree extends from the feet to within a few inches below the knees; there is very slight œdema at both wrists. When examined in the recumbent position the costal arch in the left infra-axillary region is somewhat bulging, and the left side of the abdomen appears distended with a uniform mass. A fulness is apparent in the epigastric region. On palpation, corresponding to the visible enlargement in the left half of the abdomen a firm mass is to be felt, which apparently emerges from beneath the left costal arch. Its surface is smooth and its borders everywhere regular. The lower end of the structure is rounded and extends to within three finger-